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DB=USPT; PLUR=YES; OP=OR			
L63	("6205447")[URPN]	42	L63
L62	("6212524")[URPN]	34	L62
L61	(5806060 | 5995958 | 5675785 | 5659724 | 5550971 | 5386556)![PN]	6	L61
L60	("6212524")[PN]	1	L60
L59	("6167405")[URPN]	47	L59
L58	(5870746 | 5708828 | 5918232)![PN]	3	L58
L57	("6167405")[PN]	1	L57
L56	("5692181")[URPN]	90	L56
L55	(5519859 | 5557791 | 5261093 | 5630122 | 5189608 | 5555365 | 5455945 | 5603025 | 5600829 | 5287493)![PN]	10	L55
L54	("5692181")[PN]	1	L54
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L53	6205447.pn.	2	L53
L52	6212524.pn.	2	L52
L51	6167405.pn.	2	L51

L50	5692181.pn.	2	L50
DB=USPT; PLUR=YES; OP=OR			
L49	("7007029")[URPN]	0	L49
L48	(6212524 | 5978788 | 5799286 | 6377993 | 5615109 | 5767854 | 5794246 | 5832496 | 6594653 | 6484179)![PN]	10	L48
L47	("7007029")[PN]	1	L47
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L46	7007029.pn.	3	L46
DB=USPT; PLUR=YES; OP=OR			
L45	(5475837 | 5430869 | 5168565 | 4817036 | 4606002 | 4811199)![PN]	6	L45
L44	("5560007")[PN]	1	L44
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L43	5560007.pn.	2	L43
DB=USPT; PLUR=YES; OP=OR			
L42	'6032146'.pn.	1	L42
L41	'6032146'.pn.	1	L41
L40	'5168565'.pn.	1	L40
L39	'5560007'.pn.	1	L39
L38	'5560007'.pn.	1	L38
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L37	L33 not @py>1998	1	L37
L36	L32 and 706.clas.	3	L36
L35	L32 and 717.clas.	4	L35
L34	L32 and 705.clas.	47	L34
L33	L32 and 707.clas.	226	L33
L32	L31 and (star with schema or star near schema or star adj schema or snowflake or snow with flake or snow adj flake or star-reverse-star or star-star-reverse)	297	L32
L31	(datawarehouse or data with warehouse or data near warehouse or data adj warehouse or datamart or data adj mart or data near mart or data with mart)	7292	L31
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L2	707/10	13474	L2
L1	707/1	8689	L1

END OF SEARCH HISTORY

L56: Entry 87 of 90 File: USPT Jan 11, 2000

US-PAT-NO: 6014670
DOCUMENT-IDENTIFIER: US 6014670 A

TITLE: Apparatus and method for performing data transformations in data warehousing

DATE-ISSUED: January 11, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Zamanian; M S Kiumarse	San Francisco	CA		
Nesamoney; Diaz	San Francisco	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Informatica Corporation	Menlo Park	CA			02

APPL-NO: 08/966449 [PALM]
DATE FILED: November 7, 1997

INT-CL-ISSUED: [06] G06F 17/30

INT-CL-CURRENT:

TYPE IPC	DATE
CIPP G06 F 17/30	20060101

US-CL-ISSUED: 707/101; 707/100
US-CL-CURRENT: 707/101; 707/100

FIELD-OF-CLASSIFICATION-SEARCH: 707/101, 707/201, 707/3, 707/4, 707/7, 707/100
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PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5692181	November 1997	Anand et al.	707/102
☐	5706495	January 1998	Chadha et al.	707/2
☐	5708828	January 1998	Coleman	707/523

☐	5721903	February 1998	Anand et al.	707/5
☐	5781911	July 1998	Young et al.	707/201
☐	5794228	August 1998	French et al.	707/2
☐	5794229	August 1998	French et al.	707/2
☐	5794246	August 1998	Sankaran et al.	707/101
☐	5826258	October 1998	Gupta et al.	707/4
☐	5832496	November 1998	Anand et al.	707/102
☐	5842213	November 1998	Odom et al.	707/100
☐	5870746	February 1999	Knutson et al.	707/101
☐	5870747	February 1999	Sundaresan	707/101
☐	5873102	February 1999	Bridge, Jr. et al.	707/204

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Squire, Cass. "Data Extraction and Transformation for the Data Warehouse." 1995 ACM Sigmod International Conference on Management of Data, San Jose, CA, USA, May 22-25, 1995. pp. 446-447. XP0092091745.

ART-UNIT: 277

PRIMARY-EXAMINER: Kulik; Paul V.

ASSISTANT-EXAMINER: Shah; Sanjiv

ATTY-AGENT-FIRM: Wagner, Murabito & Hao LLP

ABSTRACT:

A transformation description language (TDL) for specifying how data is to be manipulated in a data warehousing application. The TDL is comprised of a source for storing raw data, one or more transformation objects for processing the raw data according to predefined instructions, and a target for storing the processed data. A mapping is used for directing the data flow between the I/O ports corresponding to the source, the plurality of transformation objects, and the target. The mapping specifies the connectivity between the source, transformation, and target objects as well as the order of these connections. There are a number of different transformations which can be performed to manipulate the data. Some such transformations include: an aggregator transformation, an expression transformation, a filter transformation, a lookup transformation, a query transformation, a sequence transformation, a stored procedure transformation, and an update strategy transformation.

51 Claims, 13 Drawing figures

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starER: a conceptual model for data warehouse design - Tryfona - Cited by 75
Why is the snowflake schema a good data warehouse design? - Levene - Cited by 19

Why is the **Snowflake Schema** a Good **Data Warehouse** Design? - Levene ...
The **snowflake schema** represents a dimensional model which is composed of a ... **1998** 8 Conceptual **data warehouse** design - Husemann, Lechtenborger et al. ...
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Why is the **snowflake schema** a good **data warehouse** design?
This implies that relations in the **data warehouse** can be updated independently of ... Conference on System Sciences-Volume 7, p.334, January 06-09, **1998** ...
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[PDF] A Design and Practical Use of Spatial **Data Warehouse**
File Format: PDF/Adobe Acrobat
Snowflake schema of a spatial **data warehouse** for marketing plan ... discovery and **Data** Mining, PAKDD-98. Berlin: Springer-Verlag, **1998**,. pp.110-121. ...
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File Format: PDF/Adobe Acrobat
A **snowflake schema** for storing output simulation **data** is. proposed in this section, ... Kimball, R. **1998**. The **data warehouse** lifecycle toolkit: ...
ieeexplore.ieee.org/iel5/9441/29988/01371379.pdf?arnumber=1371379 - Similar pages

Amazon.com: **Data Warehousing** with Informix: Best Practices: Books ...
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Business Intelligence FAQs
Ralph Kimball, his book The **Data Warehouse** Life Cycle Toolkit, **1998**, ... A **snowflake schema** is an extension of star schema, where the dimension tables are ...
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[PPT] Decision Support, **Data Warehousing**, and OLAP
File Format: Microsoft Powerpoint - View as HTML
Data Warehousing Market. Hardware: servers, storage, clients; **Warehouse** DBMs; Tools; Market growing from. $2B in 1995 to $8 B in **1998** (Meta Group) ...
www.educationdw.com/tutorial/DW_navathe.pps - Similar pages

Technical Resume: Lead, **Data Warehousing**
Developer Resume: Lead, **Data Warehousing Data** Integrator, Decision Stream, ... including a rapidly changing dimension, in a **snowflake schema**. ...
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Why is the snowflake schema a good data warehouse design?

Source **Information Systems** archive
Volume 28 , Issue 3 (May 2003) table of contents
Pages: 225 - 240
Year of Publication: 2003
ISSN:0306-4379

Authors Mark Levene School of Computer Science and Information Systems, Birkbeck College, University of London, Malet Street, London WC1E 7HX, UK
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Publisher Elsevier Science Ltd. Oxford, UK, UK

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↑ ABSTRACT

Database design for data warehouses is based on the notion of the snowflake schema and its important special case, the star schema. The snowflake schema represents a dimensional model which is composed of a central fact table and a set of constituent dimension tables which can be further broken up into subdimension tables. We formalise the concept of a snowflake schema in terms of an acyclic database schema whose join tree satisfies certain structural properties. We then define a normal form for snowflake schemas which captures its intuitive meaning with respect to a set of functional and inclusion dependencies. We show that snowflake schemas in this normal form are independent as well as separable when the relation schemas are pairwise incomparable. This implies that relations in the data warehouse can be updated independently of each other as long as referential integrity is maintained. In addition, we show that a data warehouse in snowflake normal form can be queried by joining the relation over the fact table with the relations over its dimension and subdimension tables. We also examine an information-theoretic interpretation of the snowflake schema and show that the redundancy of the primary key of the fact table is zero.

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Note: OCR errors may be found in this Reference List extracted from the full text article. ACM has opted to expose the complete List rather than only correct and linked references.

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Daniel L. Moody, Theoretical and practical issues in evaluating the quality of conceptual models: current state and future directions, Data & Knowledge Engineering, v.55 n.3, p.243-276, December 2005

↑ INDEX TERMS

Primary Classification:
H. Information Systems
↳ **H.2** DATABASE MANAGEMENT
↳ **H.2.1** Logical Design
↳ **Subjects:** Data models

Additional Classification:
H. Information Systems
↳ **H.2** DATABASE MANAGEMENT
↳ **H.2.1** Logical Design
↳ **Subjects:** Normal forms
↳ **H.2.7** Database Administration
↳ **Subjects:** Data warehouse and repository

General Terms:
Design, Theory

Keywords:
acyclic database schema, data warehouse design, independent and separable database schema, star and snowflake schema

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Mark Levene:	Judit Bar-Ilan	Boris Mirkin
	Kerima Benkerimi	Wilfred Ng
	José Borges	Rajesh Pampapathi
	José Borges	Alexandra Poulovassilis
	Ethan Collopy	Sara Schwartz
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1 Designing data marts for data warehouses
October 2001 **ACM Transactions on Software Engineering and Methodology (TOSEM)**, Volume 10 Issue 4
Publisher: ACM Press
Full text available: pdf(203.43 KB) Additional Information: full citation, abstract, references, index terms, review

Data warehouses are databases devoted to analytical processing. They are used to support decision-making activities in most modern business settings, when complex data sets have to be studied and analyzed. The technology for analytical processing assumes that data are presented in the form of simple data marts, consisting of a well-identified collection of facts and data analysis dimensions (star schema). Despite the wide diffusion of data warehouse technology and concepts, we still miss me ...

Keywords: conceptual modeling, data mart, data warehouse, design method, software quality management

2 Database: A methodological framework for conceptual data warehouse design
Leopoldo Zepeda, Matilde Celma, Ramón Zatarain
March 2005 **Proceedings of the 43rd annual southeast regional conference - Volume 1 ACM-SE 43**
Publisher: ACM Press
Full text available: pdf(443.39 KB) Additional Information: full citation, abstract, references, index terms

A Data Warehouse (DW) has been an approach adopted for giving support to the process of taking decisions in an organization. This paper is concerned with the data warehouse conceptual schema design starting from the conceptual operational schemas and user requirements. We propose and illustrate an algorithm for automatic conceptual schema development. Our algorithm uses an enterprise schema represented with UML as a starting point for source driven data warehouse schema design and produces a set ...

Keywords: UML, multidimensional design

3 A comparison of data warehousing methodologies
Arun Sen, Atish P. Sinha
March 2005 **Communications of the ACM**, Volume 48 Issue 3
Publisher: ACM Press

Full text available: pdf(117.81 KB) Additional Information: full citation, abstract, references, index terms
html(28.41 KB)

Using a common set of attributes to determine which methodology to use in a particular data warehousing project.

4 Balancing redundancy and query costs in distributed data warehouses

Klaus-Dieter Schewe, Jane Zhao

January 2005 **Proceedings of the 2nd Asia-Pacific conference on Conceptual modelling - Volume 43 APCCM '05**

Publisher: Australian Computer Society, Inc.

Full text available: pdf(240.33 KB) Additional Information: full citation, abstract, references, index terms

Abstract State Machines (ASMs) encourage high-level system specifications without forcing the development into the "formal methods straight-jacket". This makes them an ideal formal method for applications in areas, where otherwise only semi-formal methods are used. One such area is the development of data warehouse and on-line analytical processing (OLAP) applications to which this article contributes. Based on an ASM ground model for data warehouses we show which problems have to be solved in t ...

Keywords: abstract state machine, cost model, data warehouse, distribution, refinement

5 Articles: Reconsidering Multi-Dimensional schemas

Tim Martyn

March 2004 **ACM SIGMOD Record**, Volume 33 Issue 1

Publisher: ACM Press

Full text available: pdf(163.67 KB) Additional Information: full citation, abstract, references, citings

This paper challenges the currently popular "Data Warehouse is a Special Animal" philosophy and advocates that practitioners adopt a more conservative "Data Warehouse=Database" philosophy. The primary focus is the relevancy of Multi-Dimensional logical schemas. After enumerating the advantages of such schemas, a number of caveats to the presumed advantages are identified. The paper concludes with guidelines and commentary on implications for data warehouse design methodologies.

6 Handling multiple points of view in a multimedia data warehouse

Anne-Muriel Arigon, Anne Tchounikine, Maryvonne Miquel

August 2006 **ACM Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP)**, Volume 2 Issue 3

Publisher: ACM Press

Full text available: pdf(586.25 KB) Additional Information: full citation, abstract, references, index terms

Data warehouses are dedicated to collecting heterogeneous and distributed data in order to perform decision analysis. Based on multidimensional model, OLAP commercial environments such as they are currently designed in traditional applications are used to provide means for the analysis of facts that are depicted by numeric data (e.g., sales depicted by amount or quantity sold). However, in numerous fields, like in medical or bioinformatics, multimedia data are used as valuable information in the ...

Keywords: Data warehouse, OLAP, descriptor, functional version, multimedia

7 An overview of data warehousing and OLAP technology

Surajit Chaudhuri, Umeshwar Dayal

March 1997 **ACM SIGMOD Record**, Volume 26 Issue 1

Publisher: ACM Press

Full text available: pdf(101.60 KB) Additional Information: full citation, abstract, citings, index terms

Data warehousing and on-line analytical processing (OLAP) are essential elements of decision support, which has increasingly become a focus of the database industry. Many commercial products and services are now available, and all of the principal database management system vendors now have offerings in these areas. Decision support places some rather different requirements on database technology compared to traditional on-line transaction processing applications. This paper provides an overview ...

8 Industrial-strength data warehousing

Arun Sen, Varghese S. Jacob
September 1998 **Communications of the ACM**, Volume 41 Issue 9
Publisher: ACM Press
Full text available: pdf(135.53 KB) Additional Information: full citation, citings, index terms, review

9 Using abstract state machines for distributed data warehouse design

Jane Zaho, Klaus-Dieter Schewe
January 2004 **Proceedings of the first Asian-Pacific conference on Conceptual modelling - Volume 31 APCCM '04**
Publisher: Australian Computer Society, Inc.
Full text available: pdf(382.76 KB) Additional Information: full citation, abstract, references, citings, index terms

Data Warehouses are data-intensive systems that are used for analytical tasks. As these tasks do not depend on the latest updates by transactions, data warehouses can be set up in a way that input of data from operational databases and output to dialogue interfaces for on-line analytical processes (OLAP) can be separated. In the paper we describe how abstract state machines (ASMs) can be used to design distributed data warehouses. We formalise the ground idea of data warehouses by a ground model ...

10 Towards OLAP security design — survey and research issues

Torsten Priebe, Günther Pernul
November 2000 **Proceedings of the 3rd ACM international workshop on Data warehousing and OLAP**
Publisher: ACM Press
Full text available: pdf(107.83 KB) Additional Information: full citation, references, citings, index terms

Keywords: OLAP, access control, data warehouse, design, security

11 starER: a conceptual model for data warehouse design

Nectaria Tryfona, Frank Busborg, Jens G. Borch Christiansen
November 1999 **Proceedings of the 2nd ACM international workshop on Data warehousing and OLAP**
Publisher: ACM Press
Full text available: pdf(742.63 KB) Additional Information: full citation, abstract, references, citings, index terms

Modeling data warehouses is a complex task focusing, very often, into internal structures and implementation issues. In this paper we argue that, in order to accurately reflect the users requirements into an error-free, understandable, and easily extendable data warehouse schema, special attention should be paid at the conceptual modeling phase. Based on a real mortgage business warehouse environment, we present a set of user modeling requirements and we discuss the involved concepts. Under ...

Keywords: ER model, conceptual modeling, data warehouse, star structure

12 CubiST: a new algorithm for improving the performance of ad-hoc OLAP queries

Lixin Fu, Joachim Hammer
November 2000 **Proceedings of the 3rd ACM international workshop on Data warehousing and OLAP**
Publisher: ACM Press
Full text available: pdf(296.08 KB) Additional Information: full citation, references, citings, index terms

Keywords: OLAP, data cube, data warehouse, index structure, query optimization, query processing

13 Congressional samples for approximate answering of group-by queries

Swarup Acharya, Phillip B. Gibbons, Viswanath Poosala
May 2000 **ACM SIGMOD Record , Proceedings of the 2000 ACM SIGMOD international conference on Management of data SIGMOD '00**, Volume 29 Issue 2
Publisher: ACM Press
Full text available: pdf(1.26 MB) Additional Information: full citation, abstract, references, citings, index terms

In large data warehousing environments, it is often advantageous to provide fast, approximate answers to complex decision support queries using precomputed summary statistics, such as samples. Decision support queries routinely segment the data into groups and then aggregate the information in each group (*group-by* queries). Depending on the data, there can be a wide disparity between the number of data items in each group. As a result, approximate answers based on uniform random sample ...

14 Join synopses for approximate query answering

Swarup Acharya, Phillip B. Gibbons, Viswanath Poosala, Sridhar Ramaswamy
June 1999 **ACM SIGMOD Record , Proceedings of the 1999 ACM SIGMOD international conference on Management of data SIGMOD '99**, Volume 28 Issue 2
Publisher: ACM Press
Full text available: pdf(1.54 MB) Additional Information: full citation, abstract, references, citings, index terms

In large data warehousing environments, it is often advantageous to provide fast, approximate answers to complex aggregate queries based on statistical summaries of the full data. In this paper, we demonstrate the difficulty of providing good approximate answers for join-queries using only statistics (in particular, samples) from the base relations. We propose join synopses as an effective solution for this problem and show how precomputing just one join synopsis

15 Research papers: data cleaning and mapping: Supporting executable mappings in model management

Sergey Melnik, Philip A. Bernstein, Alon Halevy, Erhard Rahm
June 2005 **Proceedings of the 2005 ACM SIGMOD international conference on Management of data**
Publisher: ACM Press
Full text available: pdf(408.49 KB) Additional Information: full citation, abstract, references

Model management is an approach to simplify the programming of metadata-intensive applications. It offers developers powerful operators, such as Compose, Diff, and Merge, that are applied to models, such as database schemas or interface specifications, and to

mappings between models. Prior model management solutions focused on a simple class of mappings that do not have executable semantics. Yet many metadata applications require that mappings be executable, expressed in SQL, XSLT, or other data ...

16 Research sessions: continuous queries and streams: Processing complex aggregate queries over data streams

Alin Dobra, Minos Garofalakis, Johannes Gehrke, Rajeev Rastogi

June 2002 **Proceedings of the 2002 ACM SIGMOD international conference on Management of data SIGMOD '02**

Publisher: ACM Press

Full text available: pdf(1.50 MB) Additional Information: full citation, abstract, references, citings, index terms

Recent years have witnessed an increasing interest in designing algorithms for querying and analyzing streaming data (i.e., data that is seen only once in a fixed order) with only limited memory. Providing (perhaps approximate) answers to queries over such continuous data streams is a crucial requirement for many application environments; examples include large telecom and IP network installations where performance data from different parts of the network needs to be continuously collected and a ...

17 An information-theoretic approach to normal forms for relational and XML data

Marcelo Arenas, Leonid Libkin

June 2003 **Proceedings of the twenty-second ACM SIGMOD-SIGACT-SIGART symposium on Principles of database systems**

Publisher: ACM Press

Full text available: pdf(309.44 KB) Additional Information: full citation, abstract, references, citings, index terms

Normalization as a way of producing good database designs is a well-understood topic. However, the same problem of distinguishing well-designed databases from poorly designed ones arises in other data models, in particular, XML. While in the relational world the criteria for being well-designed are usually very intuitive and clear to state, they become more obscure when one moves to more complex data models.Our goal is to provide a set of tools for testing when a condition on a database design, ...

18 Database design: On redundancy vs dependency preservation in normalization: an information-theoretic study of 3NF

Solmaz Kolahi, Leonid Libkin

June 2006 **Proceedings of the twenty-fifth ACM SIGMOD-SIGACT-SIGART symposium on Principles of database systems PODS '06**

Publisher: ACM Press

Full text available: pdf(224.56 KB) Additional Information: full citation, abstract, references, index terms

A recently introduced information-theoretic approach to analyzing redundancies in database design was used to justify normal forms like BCNF that completely eliminate redundancies. The main notion is that of an information content of each datum in an instance (which is a number in [0,1]): the closer to 1, the less redundancy it carries. In practice, however, one usually settles for 3NF which, unlike BCNF, may not eliminate all redundancies but always guarantees dependency preservation.In this pa ...

19 An information-theoretic approach to normal forms for relational and XML data

Marcelo Arenas, Leonid Libkin

March 2005 **Journal of the ACM (JACM)**, Volume 52 Issue 2

Publisher: ACM Press

Full text available: pdf(365.86 KB) Additional Information: full citation, abstract, references, index terms

Normalization as a way of producing good relational database designs is a well-

understood topic. However, the same problem of distinguishing well-designed databases from poorly designed ones arises in other data models, in particular, XML. While, in the relational world, the criteria for being well designed are usually very intuitive and clear to state, they become more obscure when one moves to more complex data models.Our goal is to provide a set of tools for testing when a condition on a data ...

Keywords: Information theory, XML, design, normal forms, normalization algorithms, relational databases

20 Virtual extension: Data warehousing in environmental digital libraries

Richard D. Holowczak, Nabil R. Adam, Francisco J. Artigas, Irfan Bora

September 2003 **Communications of the ACM**, Volume 46 Issue 9

Publisher: ACM Press

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